

## NXP T3G 7130 TD-SCDMA 解决方案

关键词: TD-SCDMA, GSM, GPRS, EDGE, 3G 手机, PMU, MMI, T3G,

摘要: NXP公司的GSM/GPRS/EDGE/TD-SCDMA系统解决方案T3G 7130采用基于ARM9的多媒体平台, NXP提供的核心芯片组包括双模式数字基带, GSM/GPRS收发器和功率管理单元(PMU). 协议堆栈包括可扩充的人-机接口(MMI), 并且完全和应用硬件互操作, 从而优化了设计, 提供杰出的待机和通话时间. 本文介绍了GSM/GPRS/EDGE/TD-SCDMA参考设计的主要性能, 系统方图以及主要器件如, PCF5213 Nexperia(TM) 多媒体基带, UAA3587 RF SiP单片 GSM/GPRS/EDGE RF 收发器, NXP Bluetooth 1.2 SiP BGB203与BGB204和功率管理单元 PCF50611 的性能.



NXP公司的GSM/GPRS/EDGE/TD-SCDMA系统解决方案T3G 7130采用基于ARM9的多媒体平台, NXP提供的核心芯片组包括双模式数字基带, GSM/GPRS收发器和功率管理单元(PMU). 协议堆栈包括可扩充的人-机接口(MMI), 并且完全和应用硬件互操作, 从而优化了设计, 提供杰出的待机和通话时间. 本文介绍了GSM/GPRS/EDGE/TD-SCDMA参考设计的主要性能, 系统方图以及主要器件如, PCF5213 Nexperia(TM) 多媒体基带, UAA3587 RF SiP单片 GSM/GPRS/EDGE RF 收发器, NXP Bluetooth 1.2 SiP BGB203, BGB204和功率管理单元 PCF50611 的性能.

### Nexperia GSM/GPRS/EDGE/TD-SCDMA system solution (T3G 7130)

This GSM/GPRS/EDGE/TD-SCDMA reference design, developed in close cooperation with T3G, a market-leading provider of chipsets and solutions for TD-SCDMA terminals, is a breakthrough for the China 3G market.

The design offers a wide range of multimedia applications, including video and connectivity, along with the industry's highest data rate. It also offers the lowest power consumption, as proven in recent field trials.

Built around an ARM9-based multimedia platform, the T3G 7130 is a cost-effective yet flexible reference design that lets handset manufacturers service the growing need for next-generation 3G.

The NXP core chipset includes a dual-mode digital baseband, a GSM/EGPRS transceiver and a power management unit (PMU). The protocol stack includes an extendable man-machine interface (MMI) and is fully tested for interoperability with the application hardware. The result is an optimized design that provides outstanding standby and connection times.

To support TD-SCDMA, the core chipset has been extended with a TD-SCDMA modem IC developed by T3G, a TD-SCDMA analog baseband, and a TD-SCDMA RF module. A video coprocessor extends the multimedia capabilities of the core chipset.

To help customers design the right products quickly, we offer an extensive support network of software engineers and cellular experts working in locations throughout the world, with a particularly strong presence in Asia. We combine this field support with regularly held training sessions, for hands-on learning.

#### 主要性能:

- Dual-mode GSM/GPRS/EDGE/TD-SCDMA reference design
- 104-MHz ARM946 processor
- Telecom features
  - 2G performance: Quad-band EGPRS Class 10 release 99
  - 3G performance: TD-SCDMA (2010 to 2025 MHz), 3GPP Rel 4, RAN 19 (Mar 2003), PS (DL 384 kbps, UL 128 kbps), CSD (64-kbps UL/DL)
  - SMS, EMS Rel 4
  - Audio codecs: HR, FR, EFR, AMR-NB
  - Open audio interface (PCM, I2S)
  - CCCV-mode charging
  - FAT 16 file system
  - TTY
  - Full duplex hands-free
  - Support for MMC/SD/T-Flash card
  - Voice Clarity audio enhancement
- Connectivity features
  - USB 2.0 full-speed device
  - Bluetooth 1.2
  - RS-232, IrDA (drivers)
- Multimedia features
  - 2-Mpixel camera support
  - MPEG4/H.263 video player and encoder
  - MP3/AAC player
  - SW polyphony, 64 voices, stereo, 32 kHz
  - JAVA, JTWI
  - DRM 1.0 agent (FL, CD, SD)
  - Video telephony

#### 系统方框图:

- PCF5213 Nexperia multimedia baseband
- UAA3587 RF SiP Complete, single-package GSM/GPRS/EDGE RF transceiver
- Complete, plug-and play Bluetooth 1.2 solutions in a single package
- Longer battery life and smaller phones



and other system options e.g. big or little-endian operation.

### DSP 子系统

Based on Adelante's RD16023 DSP core, the advanced DSP sub-system provides all GSM-specific signal processing, (voice & channel coding, equalization) and features like echo/noise suppression, voice recognition, and data compression.

### 外设区块:

The PCF5213 has an extensive on-chip peripheral set designed to support communication as well as end-user applications. Included peripheral blocks are:

- DMA unit for fast peripheral input and output
- GPRS encryption algorithm coprocessor
- System and watchdog control timers

### 主要特性:

- Supports quad-band (850, 900, 1800, 1900 MHz) operation for GSM/GPRS/EDGE and acts as dual-mode UMTS controller
- Fast data transfer: EGPRS Class 12, HSCSD Class 12 and CSD
- Full speech coding: AMR, EFR, FR, HR codecs with WAMR upgrade option
- Powerful ARM946E-S® 104 MHz RISC processor with on-chip caches
- Powerful Adelante RD16023 104 MHz REAL DSP sub-system with extended address range through paging mechanism
- Advanced multimedia features:
  - stereo audio DAC/ADC
  - microphone bias output and analog FM input
  - FM radio input
  - MP3 Player
  - polyphonic melody generation (FM synthesizer) and integrated hands-free buffer
- Peripheral connectivity: 920 kbit/s UART, Flash Card Interface, UMTS SIM (T = 1 protocol) and 1.8/3 V SIM interfaces, USB, I2S, SPI, I2C-bus, etc.
- Enhanced External Bus Interface: page/burst mode support and extended address range
- 3 JTAG ports — DSP, SC, and Analog —for simultaneous, real-time debug
- Increased security: version register accessible by SC software and serial number register for security applications
- Advanced process technology: 0.18 or 0.12 (digital part) and 0.25  $\mu\text{m}$  (analog part) CMOS.

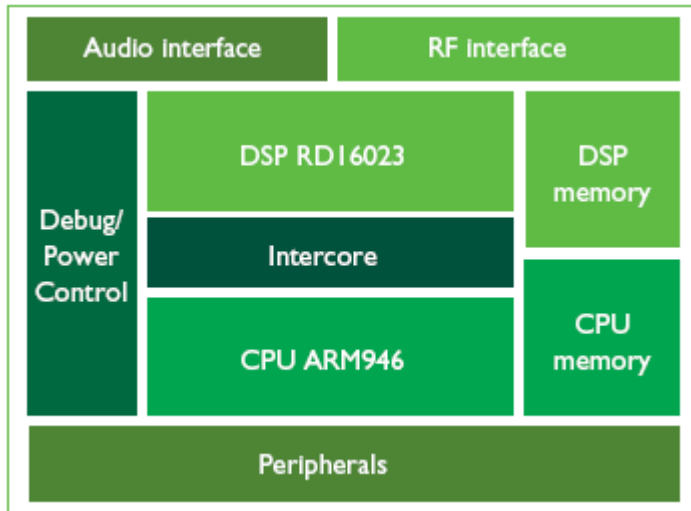


图 2. PCF5213 方框图.

First of a new family for advanced 2.5G/3G mobile multimedia phone applications

- 16 external interrupts with de-bouncing capability
- 16 -bit external bus interface with page and burst mode support
- Control serial link for analog functions
- 44 general purpose I/O pins multiplexed with functional pins
- GSM/UMTS SIM units
- Keyboard scanner
- Flash Card Interface
- USB device (version 1.1)
- Real-Time Clock
- PWM with three output channels.
- 2 UARTs (920 kbit/s)
- low-speed IrDA
- 3 SPIs (master/slave) up to 13 Mbit/s
- 16 -bit I2S interface
- 400 kbit/s I2C bus.

PCF5213 的详情请见:

[http://www.nxp.com/acrobat\\_download/literature/9397/75010442.pdf](http://www.nxp.com/acrobat_download/literature/9397/75010442.pdf)

二.UAA3587 RF SiP 单片 GSM/GPRS/EDGE RF 收发器

The UAA3587, the first Philips System-in-Package (SiP) solution to use a new silicon-based structure, is a complete RF transceiver for GSM, GPRS, and EDGE mobile phones. It uses innovative techniques to combine passive and active components in a single package, maximizing RF performance while significantly reducing external component count and overall design size. The SiP uses 35 fewer external RF components than the previous generation and enables a design area of less than 2.5 cm<sup>2</sup> for the complete radio sub-system. Combined with the miniaturization of other components, the SiP offers increased RF performance while saving 30% more space than the previous "best-in-class" solution and 50% more than the industry average. By replacing dozens of active and passive components in a single, drop-in

solution, the SiP dramatically cuts assembly costs and time-to-market. By bringing the passive component networks closer together, the SiP shortens interconnect lengths and reduces parasitics, thereby improving overall RF performance.

#### Designed for efficiency, flexibility

The receiver uses a Near Zero-IF (NZIF) architecture. The transmitter uses a direct-conversion upmixer architecture that delivers -163 dBm/Hz at 20 MHz, a carrier rejection of greater than 35 dB, and a transmit attenuation range of 40 dB. The RF antenna switches can be controlled by up to three outputs and the transceiver as a whole can support any combination of 3 out of 4 GSM/GPRS/EDGE bands (850 / 900 / 1800 / 1900 MHz).

The SiP includes integrated Tx baluns, loop filters, and decoupling capacitors. There is an integrated Fractional-N RF synthesizer with AFC control, as well as a semi-integrated, 26-MHz oscillator clock with integrated supply regulator.

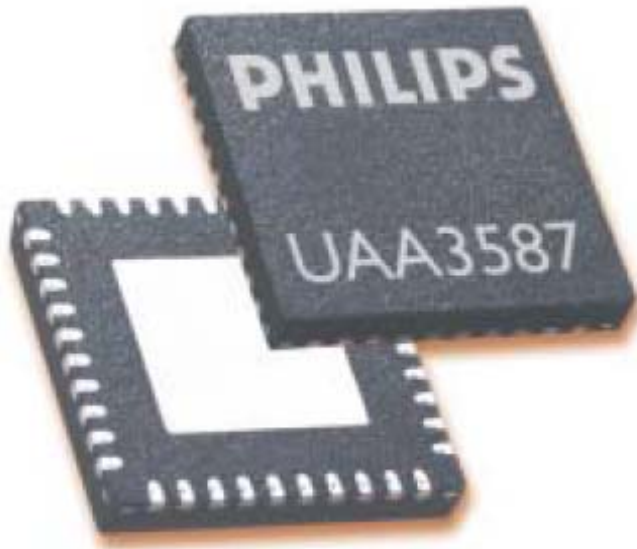
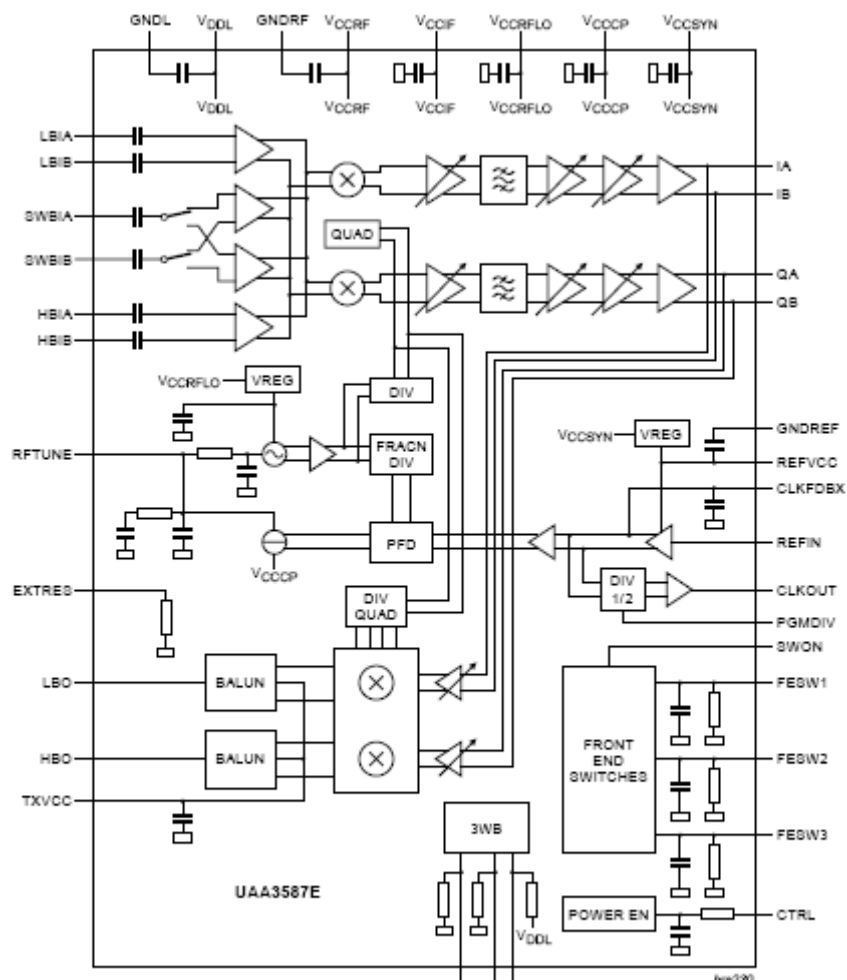


图3. UAA3587外形图.

#### 主要特性:

- Advanced, single-package RF transceiver for GSM/GPRS/EDGE
- 30% smaller than previous best-in-class solutions
- Total RF front-end < 2.5 cm<sup>2</sup>
- Eliminates 35 external components
- Integrated Tx baluns, loop filters, decoupling capacitors
- Integrated Fractional-N RF synthesizer with AFC control
- Semi-integrated 26-MHz oscillator with integrated supply regulator
- Superior performance from optimal process technologies
- 0.25μm QUBiC4 BiCMOS for RF performance
- Passive integration for lower component count
- Flip-chip assembly shortens interconnects, reduces parasitics
- Efficient, flexible architectures

- NZIF receiver architecture
- Direct conversion upmixer transmit architecture
- Triple-output control of RF antenna switches
- Any combination of 3 out of 4 bands (850 / 900 / 1800 / 1900 MHz)
- HVQFN40 package (6 x 6 x 0.85 mm)



UAA3587 RF SiP block diagram

图 4. UAA3587 方框图.

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### 三.NXP Bluetooth 1.2 SiP BGB203, BGB204

The BGB203 and BGB204 are second-generation System-in-a-Package (SiP) solutions for Bluetooth 1.2 wireless connectivity.

They provide complete, plug-and-play Bluetooth 1.2 operation in a low-cost package as small as 49 mm<sup>2</sup>. Optimized for shortrange hosted and embedded applications, they reduce board space, lower overall cost, and speed time-to-market for a wide range of mobile applications, including mobile phones, headsets, car kits, PDAs, and computer peripherals.

The SiP format, with its complete system functionality, delivers quicker design cycles, lower risk, simplified manufacturing, and a reduced bill of materials. The single-package format also simplifies assembly and testing, and reduces yield losses.

Industry-leading integration and size

Advanced process technologies and packaging techniques combine to optimize cost, size, and performance. The result is a Bluetooth solution that requires no RF-critical layout or external components.

#### 主要性能:

- Complete, fully tested Bluetooth 1.2 SiP
- Supports Bluetooth 1.2 specification, including eSCO
- Low total cost of ownership
- Ultra-small HVQFN package
- BGB203 (Flash): 7 x 8 x 1.3 mm
- BGB204 (ROM): 7 x 7 x 1.0 mm (footprint compatible with BGB203)
- Highly integrated solution
- No RF-critical layout or external components
- Integrated RF filters, balun, switches
- ARM7 processor
- Embedded 268k Flash (BGB203) or ROM (BGB204)
- High-performance Bluetooth 1.2 core
- System interfaces (UART, USB, I2C, PCM, JTAG)
- Proven N-ZIF RF transceiver
- High-performance radio for excellent range and audio quality
- Coexists with 802.11 WLAN

#### 应用:

- Smartphones and cellular phones
- Headsets and car kits
- PDAs and handheld computing devices
- Computer peripherals (keyboards, mice, printers, etc.)
- Portable media players

The baseband, which is manufactured in a cost-effective, lowpower CMOS technology, includes an ARM7 processor, 268k of embedded Flash (BGB203) or ROM (BGB204) memory, an industry-leading Bluetooth 1.2 core, and a variety of interfaces, including UART, USB, I2C, PCM, and JTAG.

The radio subsystem, manufactured in an advanced BiCMOS technology that enhances performance, is based on a Near-Zero IF (N-ZIF) radio transceiver. Passive integration technologies add a loop filter, an antenna filter that provides enhanced out-of-band blocking performance, a Tx/Rx switch, Tx and Rx baluns, the VCO resonator, and basic supply decoupling.

The entire system is housed in an HVQFN package that measures only 7 x 8 x 1.3 mm (BGB203) or 7 x 7 x 1.0 (BGB204). Only an external clock source and an antenna are required for operation.

#### Embedded Flash/ROM

The BGB203 uses a 0.15- $\mu$ m CMOS process and embeds 268k of Flash memory. The BGB204 uses a state-of-the-art 0.09- $\mu$ m CMOS process and embeds 268k of ROM. For headset and car kit applications, the BGB203 and BGB204 can be combined with the PCF87757 Blueberry™ Voice, a small (3 x 3 mm<sup>2</sup>) 1.8V voiceband codec. The on-board ROM and I2C PROM, associated with a patch mechanism, make it easy to upgrade new



headset or car kit software to the BGB204. NXP provides an optimized lower-level Bluetooth stack, so designers can modify the upperlevel stack and port it to the Flash memory of the BGB203.

For easy upgradeability, the BGB204 is footprint-compatible with the BGB203. This provides a flexible path from Flash to ROM, optimizing cost and significantly reducing project risk.

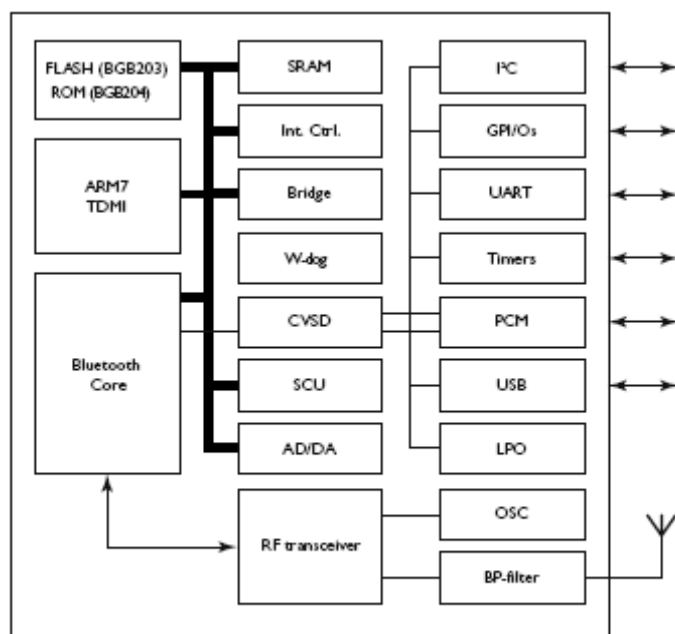
### High-performance radio

The BGB203 and BGB204 use a robust, high-performance radio that provides excellent range along with high-quality data and voice links. The radio exceeds the Bluetooth blocking spec by 20 dB in the cellular frequency bands. It offers a typical output power of +5 dBm at the antenna and offers industry-leading sensitivity (-85 dBm) at the antenna port.

### 802.11 coexistence

The BGB203 and BGB204 are designed to support collaborative coexistence with IEEE 802.11 Wireless LAN (WLAN) systems. A dedicated software and hardware interface implements Adaptive Frequency Hopping (AFH) and Packet Traffic Arbitration (PTA), with voice priority between the BGB20x and the WLAN system. An auto shutdown feature ensures that Bluetooth voice takes priority over other signals, and there is special support for burst and fragmented frames.

Bluetooth 1.2 features enhance coexistence further. The BGB203 and BGB204 offer independent AFH capability, support extended Synchronous Connection-oriented link (eSCO), which provides higher quality voice links, and support Fast Connect, which provides faster connection times between Bluetooth devices.



BGB210 functional block diagram

图 5.BGB210 功能方框图.

BGB210 详情请见:

[http://www.nxp.com/acrobat\\_download/literature/9397/75013343.pdf](http://www.nxp.com/acrobat_download/literature/9397/75013343.pdf)

四.功率管理单元 PCF50611

Philips highly integrated power management unit PCF50611 for mid-range mobile applications

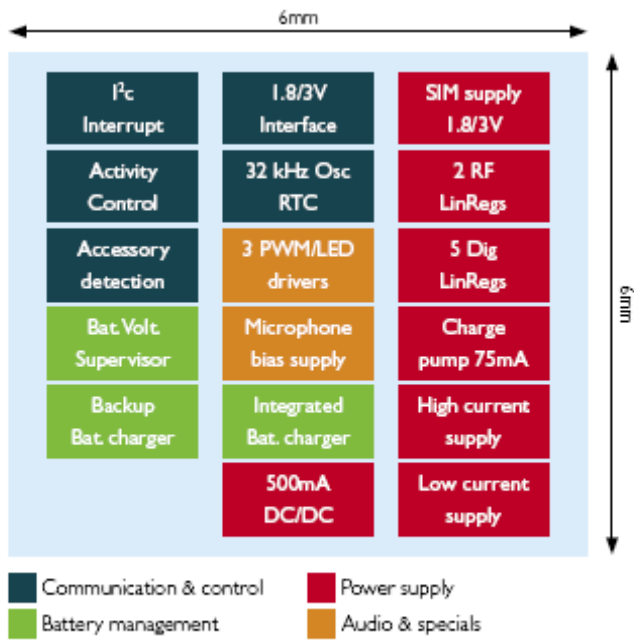
Designed for use in cellular handsets, smartphones, and VoIP phones, this highly cost-efficient device extends battery life, reduces PCB area, and enhances display performance. Housed in a very compact HVQFN52 package (6 x 6 mm), it integrates a complete charger with support for USB charging and has a series of sophisticated features that enable real-time, software-controlled power management.

The power management unit (PMU) PCF50611 provides very efficient power generation and offers real-time power management to reduce power consumption and extend battery life. It integrates a CC/CV battery charger with support for USB charging and has multiple software-programmable power supplies, including a DC/DC converter, for complete system power management on a single chip. The PMU can be broken into four functional blocks: communication and control, power supplies, battery charging and management, and support for audio and special peripherals. Sophisticated communication and control

The PCF50611 controls the power ramp-up and ramp-down sequences in the phone and also controls several system operating modes, including active, save, standby, no power, and sleep. Control data and status information are delivered to and from the core chipset via a serial, 400-kHz I2C-bus link. Interrupt requests for the host processor are generated by an integrated interrupt controller, and can be masked for custom operation. The integrated SIM-card interface operates in transparent or sequencer mode, each with arbiter and signal-level translators. For thermal protection, there is an integrated temperature-high sensor that monitors the entire PMU. Two pins control accessory recognition. When a charger is inserted in the phone's bottom connector, the PMU automatically boots up the phone. The PMU also responds to headset connection or removal and the pressing of a button. As an option, an external 32.768-kHz oscillator can be used to generate the real-time clock (RTC) and provide time-reference and alarm functions with wake-up control.

主要特性:

- Complete system power management in a single chip - 500-mA DC/DC converter - 10 LDOs and one charge pump - Support for ECO mode and ultra-low standby current - Support for staggered start-up of power supplies - Sophisticated on/off/ECO control
- Real-time power management to reduce power consumption and extend battery life - Adapts to different operating conditions - Mask-programmable start-up settings for custom operation
- Fully integrated CC/CV battery charger - Integrated pass device, thermal regulation loop, battery voltage monitor - Supports USB and wall plug/charger plug input
- Integrated USIM interface
- Real-time clock to provide time reference and alarm functions plus wake-up control for the handset
- Enhanced display performance with advanced backlight dimming management
- Support for audio peripherals - Two programmable accessory recognition pins - Bias supply for microphone
- Small power subsystem footprint (6 x 6 mm)
- Requires only 25 low-cost external components.



PCF5061 I1 functional block diagram

图 6.PCF5061 功能方框图.

PCF5061 详情请见:

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